

BIOHACK NOTES



MOLECULAR BASIS OF INHERITANCE

- BASED ON ACTIVE RECALL AND SPACED REPETITION
- TARGET 360/360 IN NEET BIOLOGY & 100/100 IN BOARDS!



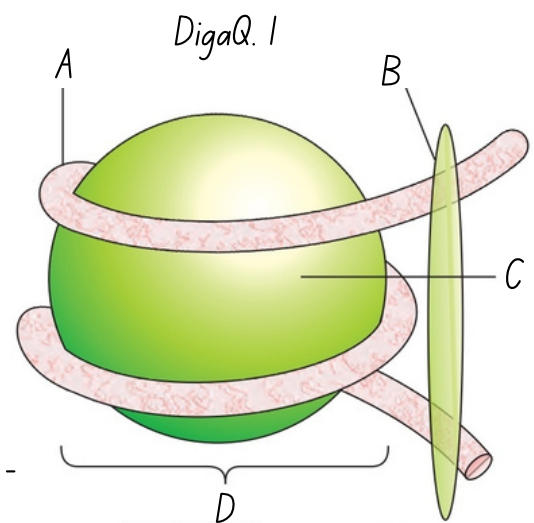
PARTH GOYAL





• DNA

1. No. of nucleotides in ϕ -174 is -
2. ϕ -174 is a _____ type of virus.
3. Total Bases in bacteriophage lambda is -
4. _____ has 4.6×10^6 bp.
5. Diploid content of human DNA is _____ no. of bases.
6. Nitrogenous base is linked to the OH of 1' C/5' C of pentose sugar through _____ linkage.
7. Deoxy form of uridine is -
8. Thymine and uracil have differences in a _____ group.
9. DNA was first identified by _____ in year _____
10. He named DNA as _____
11. X-ray diffraction data of DNA was produced by the scientists - (2)
12. Double Helix model of DNA was proposed in year _____
13. Generally DNA helix is coiled in right hand fashion. T/F
14. The pitch is _____ nm and _____ no. of base pairs are present in each turn.
15. _____ proposed the central dogma of molecular biology.
16. Distance between 1st and 15th base pair of a DNA helix is -
17. The length of human DNA is _____ (NEET)
18. Histones are rich in amino acids _____ and _____
19. Histone octamer contains proteins -
20. What is a nucleosome?
21. A typical nucleosome contains _____ bp of DNA helix.
22. Function of Non-histone Chromosomal (NHC) proteins is -
23. Chromatin that is more densely packed and stains dark are called -
24. Lightly packed and stains light is called _____
25. Heterochromatin is transcriptionally active. T/F



• THE SEARCH FOR GENETIC MATERIAL

26. In transforming principle, _____ did a series of experiments on _____ (NEET)
27. S strain bacteria have _____ coat.
28. Living S bacteria can be recovered from a solution where S bacteria may not be present. T/F
29. _____, _____, _____ concluded that DNA is the hereditary material.



PARTH GOYAL

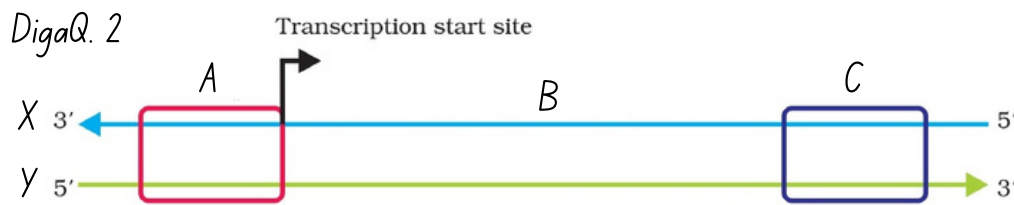
30. _____ and _____ gave the unequivocal proof that DNA is genetic material in year _____ (NEET)
31. Hersey and Chase used _____ bacteria.
32. Virus particles were separated from the bacteria by _____
33. _____ isotope of S and _____ isotope of P were used in Hershey-Chase experiment.
34. The 3 steps of Hershey-Chase experiment were -
35. QB bacteriophage have DNA as a genetic material. T/F
36. TMV have RNA as a genetic material. T/F
37. Criteria for a molecule which act as genetic material are - (4) (NEET)
38. Stability as a property of genetic material was evident from _____ experiment.
39. Tell the 2 difference between DNA and RNA -
40. _____ was the first genetic material.
41. DNA replicated conservatively. T/F
42. Semiconservative model was proved by _____ and _____ in year _____
43. ^{15}N radioactive isotope was used in their experiment. T/F
44. The various samples were separated independently on _____ gradients.
45. E. coli divided in _____ min.
46. Taylor performed experiments on _____ using _____ in year _____ and showed that - (NEET)
47. Energetically replication is an expensive process. T/F
48. There is a definite region in E. coli DNA where the replication originates. Such regions are called _____
49. Discontinuous synthesis occur in template strand with polarity -
50. Enzymes used in DNA replication are - (5) (NEET)
51. _____ fragments are formed in the lagging strand. (NEET)



• TRANSCRIPTION

52. The enzyme that help in opening of DNA helix during transcription is -
53. The transcription unit consist of regions - (3)
54. Template strand polarity is -
55. All the reference point while defining a transcription unit is made with template strand. T/F
56. Coding strand polarity is -
57. 5'-end of template strand means upstream. T/F
58. 3'-end of coding strand means downstream. T/F
59. _____ is the functional unit of inheritance.
60. What is cistron ?





61. Structural gene is monocistronic in prokaryotes/eukaryotes.
62. The actual coding or expressed sequences are called _____
63. Inheritance of a character is never affected by promoter and regulatory sequences of a structural gene. T/F
64. The 3 types of RNA are -
65. mRNA is found in the highest amount in comparison of other RNA. T/F (NEET)
66. The smallest RNA amount all the 3 is -
67. _____ play structural and catalytic role during translation.
68. The types of RNA polymerases found in bacteria are -
69. Initiation factor is ___ and termination factor is ___
70. Transcription and translation can be coupled in _____
71. In eukaryotes, ___ no. of RNA polymerases are present.
72. 5srRNA is synthesised by -
73. Tell the function of all the 3 types of RNA polymerase.
74. In capping, _____ is added at 5' end.
75. In tailing, ___-___ no. of _____ residues are added in a template dependent/independent manner.
76. The process of splicing represent the dominance of _____

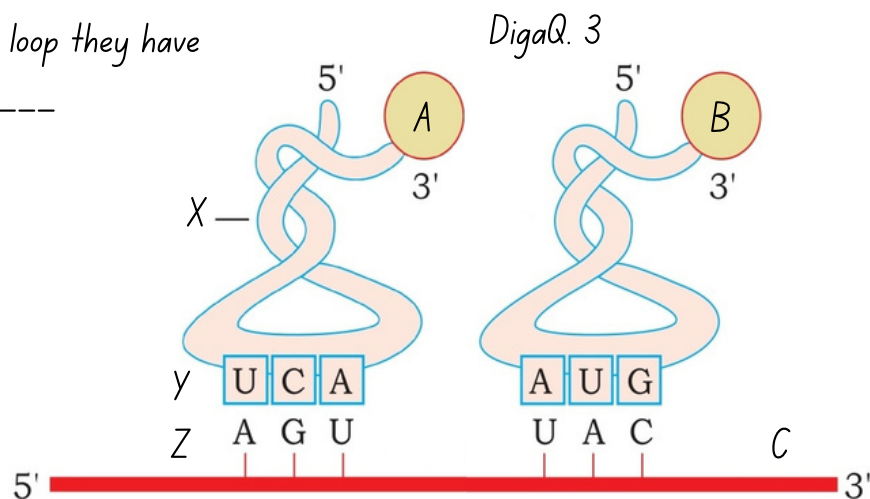


• GENETIC CODE

77. _____ who was a physicist/biologist, first proposed that codons should be triplet.
78. The chemical method developed by _____ was instrumental in synthesising RNA molecules with defined combinations of bases.
79. _____ cell-free system for protein synthesis finally helped the code to be deciphered.
80. _____ enzyme was helpful in polymerising RNA in a template independent manner.
81. Serine and proline codons are -
82. Stop codons are - (3)
83. GAG and GUG are codons for _____ and _____ respectively.
84. _____ act as a initiator codon and codes for the amino acid -
85. What does degeneracy of codon mean ?
86. Genetic code is completely universal. T/F
87. Exceptions of universality of genetic code is found in - (2)



92. In actual structure t-RNA looks like _____



• TRANSLATION

99. At the end, _____ binds to the stop codon.



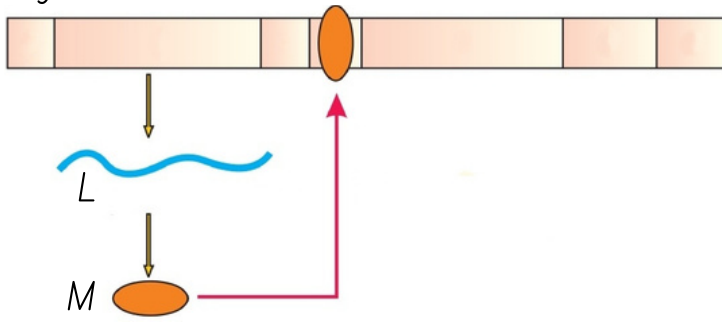
• REGULATION OF GENE EXPRESSION

III. Regulation of lac operon is positive/negative. (NEET)

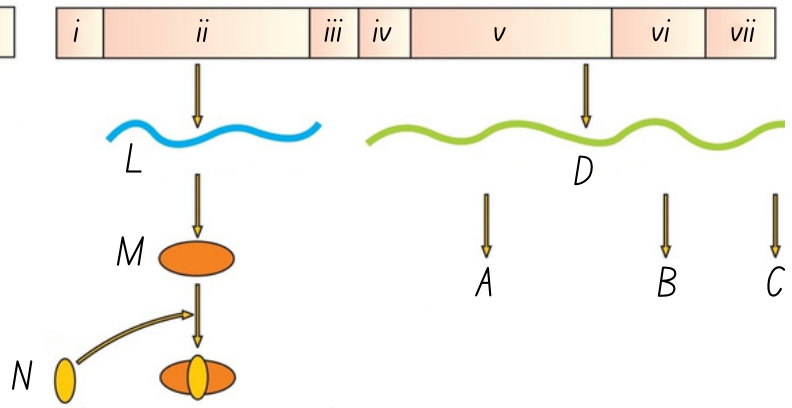


PARTH GOYAL

DigaQ. 4 - X



Y



• HUMAN GENOME PROJECT (HGP)

112. HGP was launched in year -
113. HGP was closely associated with _____
114. Approx. how many genes are in human DNA ?
115. ELSI full form -
116. _____ became a major partner in the early years of HGP.
117. HGP was completed in year -
118. Nematode whose genes are sequenced is -
119. It is pathogenic/non-pathogenic.
120. Plants whose genes are sequenced - (2)
121. Name the non-human models whose genes are sequenced (6) -
122. EST full form -
123. The 2 methodologies for HGP were -
124. BAC & YAC full form -
125. The DNA fragments were sequenced by the method developed by _____
126. Last chromosome to be sequenced was ____ which was sequenced in _____
127. Human genome contains _____ million bp.
128. Average gene consists of _____ no. of bases.
129. Largest known human gene is _____ at _____ no. bases.
130. ____ % of nucleotide bases are exactly the same in all people.
131. Less than ____ % of the genome codes for proteins.
132. The functions are unknown for over ____ % of the discovered genes.
133. ____ chromosome has most genes with _____ no. of genes.
134. ____ chromosome have least genes with _____ no. of genes.
135. In about ____ million locations SNPs occur in humans.



PARTH GOYAL



• DNA FINGERPRINTING

136. Small peaks are referred to as _____ DNA.
137. DNA is classified as micro and mini-satellites on the basis of ? (3)
138. If more than one allele occurs with a frequency greater than _____, it is called DNA polymorphism.
139. Probability of such variation in non-coding DNA sequence is more. T/F
140. Technique of DNA Fingerprinting was initially developed by _____
141. He used bulk DNA/satellite DNA.
142. VNTR full form -
143. VNTR involved northern blot hybridisation. T/F
144. In blotting, DNA fragments are transferred to membranes made of _____ or _____
145. Southern, Northern and Western blot are respectively used for -
146. Detection of hybridised DNA fragments is by _____
147. Describe the 6 steps of DNA fingerprinting -
148. VNTR is a microsatellite/minisatellite.
149. The size of VNTR varies from ___ to ___ bases.
150. The autoradiogram gives band of same sizes in -
-



MOLECULAR BASIS OF INHERITANCE



PARTH GOYAL



ANSWERS

• DNA

1. 5386
2. Bacteriophage
3. 97004 bp
4. *E. coli*
5. 13.2×10^9
6. 1°C , N-glycosidic linkage
7. Deoxythymidine
8. Methyl
9. Friedrich meischer, 1869
10. Nuclein
11. Maurice Wilkins and Rosalind Franklin
12. 1953
13. T
14. 3.4 nm, 10
15. Francis crick
16. $13 \times 0.34 \text{ nm} = 4.42 \text{ nm}$
17. 2.2 m
18. Arginine and lysine
19. 2 copies of H2A, H2B, H3 and H4
20. negatively charged DNA is wrapped around the positively charged histone octamer
21. 200
22. Packaging of chromatin
23. Heterochromatin
24. Euchromatin
25. F

• THE SEARCH FOR GENETIC MATERIAL

26. Frederick Griffith, *Streptococcus pneumoniae*
27. Mucous
28. T
29. Oswald Avery, Colin MacLeod & Maclyn McCarty
30. Alfred Hershey and Martha Chase, 1952
31. *E. coli*
32. Spinning them in centrifuge

33. ^{35}S , ^{32}P
34. Infection, Blending and Centrifugation
35. F
36. T
37. Criteria to act as genetic material
 - (i) Replication
 - (ii) stable chemically and structurally
 - (iii) provide scope for mutation
 - (iv) It should be able to express itself in the form of 'Mendelian Characters'
38. Griffith's
39. Difference between DNA and RNA
 1. DNA don't have 2'-OH- group.
 2. DNA have thymine in place of uracil.
40. RNA
41. F
42. Matthew Meselson & Franklin Stahl in year 1958
43. F, N^{15} is not a radioactive isotope.
44. CsCl
45. 20
46. *Vicia faba* (faba beans), radioactive thymidine, 1958, DNA replicate semiconservatively
47. T
48. Ori (origin of replication)
49. 5'-3'
50. Helicase, DNA polymerase, Primase, DNA ligase, Topoisomerase
51. Okazaki

• TRANSCRIPTION

52. RNA polymerase
53. Promotor, Structural gene and Terminator
54. 3'-5'
55. F



PARTH GOYAL

56. 5'-3'
57. F
58. T
59. Gene
60. a segment of DNA coding for a polypeptide
61. Eukaryotes
62. Exons
63. F
64. mRNA, rRNA, tRNA
65. F, rRNA is found in highest amount
66. tRNA
67. rRNA
68. Only I is found (fooling type q)
69. Sigma, rho
70. Bacteria
71. 3
72. RNA polymerase III
73. Functions of RNA polymerase
 1. RNA polymerase I - rRNAs (28S, 18S, & 5.8S)
 2. RNA polymerase II - hnRNA
 3. RNA pol. III - tRNA, 5srRNA, & snRNAs
74. methyl guanosine triphosphate
75. 200-300, adenylate, independent
76. RNA world

• GENETIC CODE

77. George Gamow, physicist
78. Har Gobind Khorana
79. Marshall Nirenberg's
80. Severo Ochoa
81. Serine - UCU, UCC, UCA, UCG
Proline - CCU, CCC, CCA, CCG
82. UAA, UGA, UAG
83. Glu, Val
84. AUG, methionine
85. Many codons code for single amino acid
86. F

87. Mitochondrial codons and some protozoans
88. Degeneracy, Unambiguous, Universal, Read in Contiguous fashion
89. sRNA (soluble RNA)
90. Initiator tRNA
91. 4 ends of t-RNA
 1. DHU Loop - Ribozyme bind here
 2. Anticodon loop - mRNA bind here
 3. TΨC loop - Ribosome bind here
 4. -CAA sequence - Amino acid attach here
92. Inverted - L

First position	Second position				Third position
	U	C	A	G	
U	UUU Phe	UCU Ser	UAU Tyr	UGU Cys	U
	UUC Phe	UCC Ser	UAC Tyr	UGC Cys	C
	UUA Leu	UCA Ser	UAA Stop	UGA Stop	A
	UUG Leu	UCG Ser	UAG Stop	UGG Trp	G
C	CUU Leu	CCU Pro	CAU His	CGU Arg	U
	CUC Leu	CCC Pro	CAC His	CGC Arg	C
	CUA Leu	CCA Pro	CAA Gln	CGA Arg	A
	CUG Leu	CCG Pro	CAG Gln	CGG Arg	G
A	AUU Ile	ACU Thr	AAU Asn	AGU Ser	U
	AUC Ile	ACC Thr	AAC Asn	AGC Ser	C
	AUA Ile	ACA Thr	AAA Lys	AGA Arg	A
	AUG Met	ACG Thr	AAG Lys	AGG Arg	G
G	GUU Val	GCU Ala	GAU Asp	GGU Gly	U
	GUC Val	GCC Ala	GAC Asp	GGC Gly	C
	GUA Val	GCA Ala	GAA Glu	GGA Gly	A
	GUG Val	GCG Ala	GAG Glu	GGG Gly	G

• TRANSLATION

93. Aminoacylation of tRNA
94. rRNAs and 80
95. 23S rRNA
96. UTR (untranslated regions)
97. Gene expression is regulated at
 - (i) transcriptional level
 - (ii) processing level (regulation of splicing)
 - (iii) transport of mRNA from nucleus to the cytoplasm
 - (iv) translational level.
98. T
99. Release factor

• REGULATION OF GENE EXPRESSION

- 100. Transcription level
- 101. Repressor
- 102. Something is increasing, implies we have to decrease it.
- 103. Something is decreasing, implies we have to increase it.
- 104. Francois Jacob and Jacque Monod
- 105. Arabinose
- 106. F, I means inhibitor
- 107. Repressor
- 108. Z gene - beta-galactosidase, y gene - permease, a gene - transacetylase
- 109. Lactose and allolactose
- 110. Those genes which constantly express themselves in a cell
- 111. Negative

• HGP

- 112. 1990
- 113. Bioinformatics
- 114. 20,000-25,000
- 115. Ethical, legal and social issues
- 116. Wellcome Trust (U.K.)
- 117. 2003
- 118. Caenorhabditis elegans
- 119. non-pathogenic
- 120. Rice and arabidopsis
- 121. bacteria, yeast, Caenorhabditis elegans, Drosophila, rice, Arabidopsis
- 122. Expressed sequence tags
- 123. Expressed Sequence tags and Sequence Annotation
- 124. Bacterial Artificial Chromosome & Yeast Artificial Chromosome
- 125. Frederick Sanger
- 126. Chromosome I, May 2006

- 127. 3164.7
- 128. 3000
- 129. Dystrophin, 2.4 million
- 130. 99.9
- 131. 2 %
- 132. 50
- 133. Chromosome I, 2968
- 134. Y chromosome, 231
- 135. 1.4

• DNA FINGERPRINTING

- 136. Satellite
- 137. base composition (A:T rich or G:C rich), length of segment, and number of repetitive units
- 138. 0.01
- 139. T
- 140. Alec Jeffreys
- 141. Satellite DNA
- 142. Variable Number of Tandem Repeats
- 143. F, southern blot is involved
- 144. Nitrocellulose or nylon
- 145. DNA, RNA, protein {Mnemonic - SaDa(South-DNA) NaRial(North-RNA) wasai pani (west-protein)}
- 146. Autoradiography
- 147. Steps of DNA fingerprinting
 - (i) isolation of DNA
 - (ii) digestion of DNA by restriction endonucleases
 - (iii) separation of DNA fragments by electrophoresis
 - (iv) Blotting of separated DNA fragments
 - (v) hybridisation using labelled VNTR probe
 - (vi) detection of hybridised DNA fragments by autoradiography



PARTH GOYAL

148. Mini-satellite

149. 100-20,000

150. Monozygotic twins

• DigaQs

DigaQ. 1 - Nucleosome

A - DNA

B - H1 histone

C - Histone octamer

D - Core of histone molecules

DigaQ. 2 - Transcription unit

A - Promoter

X - Template strand

B - Structural gene

Y - Coding strand

C - Terminator

DigaQ. 3 - tRNA - the adapter molecule

X - tRNA

A - Ser

Y - Anticodon

B - Tyr

Z - Codon

C - mRNA

DigaQ. 4 - lac operon

X - In absence of inducer

Y - In presence of inducer

L - Repressor mRNA

M - Repressor

N - Inducer

A - β -galactosidase

B - Permease

C - Transacetylase

D - lac mRNA



SCAN AND DONATE US SO THAT WE
CAN CREATE MORE SUCH QUALITY
CONTENT FOR YOU!

Prof: Can you show DNA and RNA
visually?

ME:



PARTH GOYAL